the vicinity of London, although, as the operations of the builder are extended in every direction year by year, their number gradually, but surely, diminishes. Where Dr. Greene writes from his own experience, he is always worth listening to, but he has a faith in Morris, which, as might be expected, often leads him awry. He quotes from the Bible about the "Sparrow" on the house-top (p. 13), but the bird alluded to is the Blue Rock Thrush (*Monticola cyanea*), for which cf. Canon Tristram's "Fauna and Flora of Palestine" (p. 31). The illustration on p. 23 is not that of the common Sparrow, but of the Tree-sparrow. At p. 46 he gives a tabular list of characters by which to distinguish the Missel-thrush from the Song-thrush, in which the former bird is said to have "no song to speak of." Evidently, Dr. Greene has never heard a "Storm-cock" in full swing. He does not love the Greenfinch, but this need not lead him to say that the species likewise "has no song." A cock Greenfinch, perched on the top of a tree in the nesting season, and singing to his mate sitting on the nest below, has a charming and varied song, like that of a very powerful Canary. The Whitethroat, of which Dr. Greene appears to know only one species, is placed in the sub-family *Motacillidæ*, and it will surprise many ornithologists to hear that the song of the Chiff-chaff is continued even till late in September (this information is derived from the Rev. F. O. Morris !). The Blackcap does *not* winter in Eastern Africa, and it can hardly be said that the Siskin "rarely nests in this country." We mention these points at the risk of appearing hypercritical, but we recognize in Dr. Greene an author who has the knack of writing good natural history books for the young, and it is therefore the more incumbent upon him to be scrupulously accurate. Let him discard Morris, and stick to Seebohm's "History of British Birds," or to the new edition of "Yarrell." Some pretty illustrations by Mr. Whymper form an additional attraction to his little book.

R. BOWDLER SHARPE.

DESCARTES.

History of Modern Philosophy. "Descartes and his School." By Prof. Kuno Fisher. Translated by J. P. Gordy, Ph.D., and edited by Noah Porter, D.D., LL.D. (London: T. Fisher Unwin, 1887.)

AMONG the many histories of modern philosophy few are so interesting and attractive as that by Prof. Kuno Fisher. The present volume consists of a translation of the third revised German edition, which includes the period of Descartes and his school; and the admirable way in which the author deals with so difficult a subject and his boldness in overcoming it are worthy of the highest praise.

The book is divided into three parts, the first of which is preceded by an introduction to the subject, showing the course of development of the Greek philosophy and that of the Middle Ages, with an account of the early history of Christianity and the Church, concluding with the periods of the Renaissance and the Reformation.

In Part I. we have an account of the early history of Descartes. He was born in the year 1596, a few days before the death of his mother, and was a weak and sickly child. Throughout his childhood he showed a strong desire for knowledge, and it was on this account that his father called him his "little philosopher."

Descartes was among the first pupils in the new school that was started at the Royal palace at La Flèche by Henry IV.; at the age of seventeen he was committed to the care and tutorage of Father Dinet. During his school life he was among the chosen pupils who, on June 10, 1610, solemnly received the heart of the king, which, by Henry's will, was to be buried in the church of La Flèche.

While going through a two years' course on philosophy, he became completely fascinated by mathematics, and was thereby incited to make a further study of it; and later on in life, seeing the true spirit of mathematics as a method of solving problems, he began by algebraical equations to solve geometrical problems, and thus to him is due the discovery of analytical geometry. On the completion of his school career, the state of his mind may be gathered from his own words—". . . I found myself involved in so many doubts and errors, that I derived no other result from my desire of learning than that I had more and more discovered my own ignorance."

The next few years of his life were spent in military service in Holland and Germany, after which, at the age of five-and-twenty, he travelled for nine years; to him his travels were studies in the great book of life, and during them he "did nothing but wander now here, now there, since I wished to be a spectator rather than an actor in the dramas of the world." The last period of his life consisted of the development and publication of his works, and the founding of a school of philosophy, concluding with his illness and death during his stay in Stockholm, to which place he was invited by Christina, then Queen of Sweden, who, being deeply interested in his works, found the difficulties in his system could better be explained by Descartes himself than by anyone else.

Although the philosophy of Descartes treats of the whole realm of Nature, we will here touch only upon those parts that are interesting to us from the scientific point of view. Not by any means the least important is his attempt to explain the origin of the world by purely mechanical laws. He bases his theory on the rest and motion of solid and liquid bodies, and the influence of the latter upon the former. Before entering upon this hypothesis, the mechanical principle of his explanation of Nature is first brought before us. He treats motion as a mode of extension, and explains it as the "translation of place (transport) of one part of matter or of one body from the vicinity of those bodies which directly touch it, and are considered at rest, into the vicinity of others."

The causes of motion are next dealt with, showing us that all changes are due to outward collision, and that since space is by no means empty, but is full of bodies moving in every direction, we may get a great number of collisions, the various possible results of which he then goes on to discuss. According to his principles, then, bodies are quite destitute of force, excepting that of resistance; changes in the material world are due to external collisions, and motion, therefore, is due to impacts. Comparing the views of Descartes with those of Galileo and Newton, we cannot do better than quote

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what the author says on this point:—"Gravity is regarded as . . . . an original property of a body belonging to it of itself. Descartes denies it. Therein consists the opposition between Galileo and Descartes; with gravity he was obliged to reject gravitation and the power of attraction. Therein consists the subsequent opposition of Newton and Descartes; he is, therefore, compelled to deny the so-called central forces, as well as every *actio in distans*."

The two essential pre-suppositions of his hypothesis are the "immeasurableness of the universe and the nullity of empty space. From the first it follows that the universe is not a spherical body, and does not consist in concentric spheres to which the stars are fastened; that there is, therefore, no celestial sphere beyond the farthest planet (Saturn), and that the sun does not lie in the same spherical superficies. From the second, it follows that the spaces of the heavens are filled with fluid matter, and that the heavenly bodies are surrounded by the latter, and subject to its influences."

Descartes supposes the earth to be completely surrounded by this fluid, and "acted upon uniformly in every direction, or carried along by its current, as a solid body in liquid matter. The planets follow also the same rule. Each is at rest in the heavens in which it is, and all the change of place which we observe in those bodies follows from the motion of the matter of the heavens which surrounds them on all sides."

By supposing, again, that this flow of the matter, which surrounds the earth and planets, describes a current "spinning round like a vortex," with the sun in the centre and the earth and planets going round it; he obtains, without considering their weight and attraction, a method by means of which their various motions may be explained. He compares this "vortex" motion of the matter with eddies of water, "as waters when they are forced to a reflux form an eddy, and draw violently within their rotary motion, and carry along with them, light floating bodies, as, for example, straws; as then these bodies, seized by the eddy, turn about their own centre, and those nearer the centre of the eddy always complete their rotation earlier than the more distant ones; as, finally, this eddy always, to be sure, describes a circular figure, but almost never a perfect circle, but extends itself, now more in length and now in breadth, wherefore the parts at the periphery are not equally distant from the centre,—so one can easily see that the motion of the planets is of the same character, and that no other conditions are necessary to explain all their phenomena."

Thus Descartes agrees with Copernicus and Galileo with regard to the heliocentric motion of the earth and planets, although basing his hypothesis on different mechanical laws; he also teaches that the earth is a planet, and rotates on its axis daily, and revolves yearly in an elliptical orbit round the sun.

The author then tells us how Descartes, after the completion of his hypothesis, postponed its publication, on account of the fate of Galileo, and how he (Descartes) expressly stated at the end that "his hypothesis not only may be, but in certain respects is, false." Although he denied the movement of the earth, it was only in a sense that followed from his idea of motion which he applied to the heavenly bodies; for, with reference to the other bodies in the heavens, it does move, but is at rest in relation to the fluid matter around it, or, as the author says, "it moves exactly as a man who is asleep in a ship, while it takes him from Dover to Calais."

In conclusion, we must add that the work of both translator and editor has been honestly done, though, as the above quotation shows, the style of the translator is susceptible of improvement, and that this volume will form a valuable addition to the libraries of students of moral philosophy. To the readers of such a work as this, consisting as it does of so many historical facts, an index is imperative, and we hope in future editions to see one inserted.

W. J. L.

A TEXT-BOOK OF ORGANIC CHEMISTRY.

A Text-book of Organic Chemistry. By A. Bernthsen, Ph.D., formerly Professor of Chemistry in the University of Heidelberg. Translated by George McGowan, Ph.D., Demonstrator in Chemistry, University College of North Wales, Bangor. (London: Blackie and Son, 1889.)

THIS work furnishes an excellent elementary account of the principles of organic chemistry. An introduction treating of the general theory of organic compounds, including the subjects of constitution, isomerism, physical properties, &c., is followed by the detailed description of the various classes of compounds and their relations to one another, the fatty compounds being first discussed, and then those belonging to the group of aromatic substances and to the pyridine group. The treatment of the various compounds in "series," all the hydrocarbons of the fatty series—paraffins, olefines and acetylenes—being, for example, fully described before any of their halogen derivatives or of the alcohols are discussed, cannot be commended from the point of view of the novice to the science, for whom the book is avowedly designed. This evil is, however, largely compensated for in the present work by the clear language invariably employed, and more especially by the frequent introduction of semi-diagrammatic tables showing the connection between various related series, such, for example, as the glycols, hydroxy-acids and dibasic acids.

The description of the aromatic compounds, prefaced by a short account of the benzene theory, is grouped about the typical hydrocarbons, benzene and its derivatives being first treated, then diphenyl with its derivatives, triphenyl-methane and its group, naphthalene, &c. Mere description of compounds is sternly and consistently avoided, its place being supplied, whenever possible, by tabulated statements, showing at a glance both the chemical and physical relations of a whole series of derivatives. These tables are a distinguishing feature of the book, and impart to it a clearness and conciseness which will render it welcome to every student.

Abundant references are provided to the original papers concerning subjects which fall without the elementary scope of the work, such as, among many others, the diazo-derivatives of the fatty series, the syntheses of glucosides, and the grouping of atoms in space, which last is treated in language which will perhaps be apt to mislead, and scarcely receives a degree of attention commensurate with its importance.

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